IN THE SPECIFICATION:

Please amend the specification as follows:

Please insert the following paragraph beginning at page 1, line 5, as follows:

-- This application is a divisional application of copending U.S. patent application number 09/858,964, filed May 17, 2001. --

Please substitute the paragraph beginning at page 3, line 21, and ending on page 4, line 2, with the following.

-- If the focus ~~tolerant~~ tolerance passes, the flow waits for convergence of residual vibrations in the X and Y directions generated in the step of focus driving/Abbe correction driving (step 1307) in Fig. 13 (step 1308), and exposure starts (step 1309). In step 1310, whether all the shots have undergone the exposure sequence is checked. If N in step 1310, the focus algorithm (steps 1303 to 1310) is repeated by using the first measured global approximate plane data (step 1302). --

Please substitute the paragraph beginning at page 4, line 27, and ending on page 5, line 8, with the following.

-- The present invention has been made to overcome the conventional drawbacks, and has as its object to provide an exposure apparatus which minimizes the influence of a defective shot on peripheral shots, reduces defective shots, reduces misoperations caused by the operator, and detects contamination of a wafer chuck within the exposure ~~process;~~ process. The present

invention also provides a maintenance method therefor, a semiconductor device manufacturing method, and a semiconductor manufacturing factory. --

Please substitute the paragraph beginning at page 6, line 23, and ending on page 7, line 3, with the following.

-- According to the present invention, there is provided a semiconductor device manufacturing method comprising the steps of installing manufacturing apparatuses, for performing various processes, including any one of the above-described exposure apparatuses, in a semiconductor manufacturing factory, and manufacturing a semiconductor device by using the manufacturing apparatuses in a plurality of processes. --

Please substitute the paragraph beginning at page 7, line 4, with the following.

-- According to the present invention, there is provided a semiconductor manufacturing factory comprising manufacturing apparatuses, for performing various processes, including any one of the above-described exposure apparatuses, a local area network for connecting the manufacturing apparatuses, and a gateway which allows the local area network to access an external network outside the factory, wherein information about at least one of the manufacturing apparatuses can be communicated. --

Please substitute the paragraph beginning at page 8, line 6, with the following.

-- Other objects and advantages besides those discussed above shall be apparent to those skilled in the art from the description of a preferred embodiment of the invention which follows.

In the description, reference is made to accompanying drawings, which form ~~apart~~ a part thereof, and which illustrate an example of the invention. Such an example, however, is not exhaustive of the various embodiments of the invention, and, therefore, reference is made to the claims which follow the description for determining the scope of the invention. --

Please substitute the paragraph beginning at page 10, line 21, and ending on page 11, line 15, with the following.

-- Fig. 1 shows the hardware arrangement of an exposure apparatus according to an embodiment of the present invention. A reticle 109 set on a reticle stage 108 is scanned at a constant speed in the direction indicated by an arrow in FIG. 1 under the control of a reticle stage controller 103. Part of a pattern image on the reticle 109 serving as a master is horizontally reversed by a projection optical system 110 and projected onto an imaging plane on a focus stage 112. The focus stage 112 is mounted on an alignment stage 113 and performs alignment in the Z direction and tilt directions (ωx and ωy). The alignment stage 113 is drivable in the X, Y, and θ directions and is scanned at a constant speed by a wafer stage controller 101 in the direction indicated by an arrow in Fig. 1, i.e., a direction opposite to the driving direction of the reticle stage 108 during scan exposure. The ratio of the scan speeds of the alignment stage 113 and reticle stage 108 is determined from the projection magnification of the projection optical system 110 and the scaling ratio of a transferred image. --

Please substitute the paragraph beginning at page 13, line 21, and ending on page 14, line 11, with the following.

-- The surface of the wafer 120 is parallel to a driving locus (wafer stage traveling surface 201) with a constant target value in the Z direction of the wafer stage. As far as the surface of the wafer 120 is ideally parallel, no defocus occurs below an exposure slit in scan exposure in this stage. In practice, however, local corrugations ~~exit~~ exist on the surface of the wafer 120 to a considerable amount with respect to the depth of focus. Thus, ~~a~~ focus is measured during exposure, and a laser must be focused not to defocus the surface of the wafer 120 immediately below the slit. This amount is 3 to 4 ~~μm~~ at a maximum with respect to the global tilt plane on a general single-side-polished wafer 120, though the amount changes depending on the surface polishing step or process of the wafer 120. To the contrary, the focus control precision assigned to focus control in exposure is about 0.1 ~~μm~~ according to the 0.15 μm L/S rule. --

Please substitute the paragraph beginning at page 14, line 12, and ending on page 15, line 3, with the following.

-- Fig. 3 shows the positional relationship between an exposure slit and focus measurement points on the imaging plane in the exposure apparatus according to the embodiment of the present invention. When the alignment stage 113 (Fig. 2) scans the wafer in the direction indicated by arrow1, focus measurement points a, b, and c are used, and when the alignment stage 113 scans the wafer in the direction indicated by arrow 2, focus measurement points A, B, and C are used. A focus measurement point S is also set at the center of the shot. ~~A focus~~ Focus is measured at combined points (a, b, c, S) and (A, B, C, S) during one cycle of a plurality of focus measurements even during a scan in order to confirm a convergence result in the focus direction during exposure. In the focus measurement cycle, an obtained focus

measurement value is determined as a focus convergence error under the following conditions (when convergence within a given focus alignment precision fails). --

Please substitute the paragraph beginning at page 16, line 4, with the following.

-- In case (B), exposure can be immediately stopped, like case (A), which produces an exposed portion and an unexposed portion within a shot. When exposure intermittently aborts within a shot, a portion where exposure has aborted is stored in the wafer stage controller 101 in Fig. 1, and emission of the illumination optical system 115 starts in a retry mode at the portion where exposure ~~has~~ was aborted. In this embodiment, exposure does not abort in such a case for the sake of descriptive simplicity, and exposure continues to the final portion left in the shot region by forcibly exposing the shot. At this time, exposure must continue without any focus measurement value. The values Z and ωy (focus and tilt position) at the final focus measurement position measured normally are most desirably used. A global focus measurement value or the neighboring focus value of a previous shot may be used. --

Please substitute the paragraph beginning at page 16, line 22, and ending on page 17, line 6, with the following.

-- Also, in a stationary exposure apparatus, a focus control error occurs when, for example, the focus tolerance check does not pass (step 1306) even if the convergence loop for performing focus measurement (step 1305), focus tolerance check (step 1306), and focus driving/Abbe correction driving (step 1307) is repeated a predetermined number of times in the flow chart of the prior art in Fig. 13, or when the variance of measurement values at respective

measurement points from a linear ~~approximate~~ approximation plane calculated between focus measurement points in a shot shown in Fig. 15 exceeds a prescribed amount. --

Please substitute the paragraph beginning at page 19, line 6, and ending on page 20, line 1, with the following.

-- In a sequence 406, whether an automatic operation mode is set is determined. If ~~Y~~ Yes in sequence 406, the shot (focus convergence error shot) is exposed under the same conditions. In step 407, whether a focus control error occurs even upon retry in the same shot is checked. If retry fails once, a forced exposure sequence 417 is executed. In forced exposure 417, not a value obtained by measuring the wafer surface, but a global focus/tilt target value which is a target value independent of a focus measurement sensor value, or the focus/tilt target value of the wafer stage obtained during the exposure time of the final portion of the previously exposed shot is adopted as a fixed target value during scan. In automatic forced exposure 417, even if the reliability of the focus measurement value degrades owing to, e.g., a fault of the focus measurement system, the exposure sequence continues with an improper focus/tilt target value. Forced exposure 417 should, therefore, be limited within a finite number of successive shots. In a sequence 413, if the result of counting the number of successive operations of forced exposure 417 exceeds five shots, the job stops even in the automatic continuation mode (sequence stop 414). --

Please substitute the paragraph beginning at page 20, line 2, with the following.

-- If the job stops, buttons as shown in Fig. 6 are displayed on the user interface in order to cause the operator to select (determine) subsequenct processing, and the flow waits for operator designation (sequence 415). Fig. 6 is a view showing an example of operation buttons displayed upon generation of a focus control error in the embodiment of the present invention. In Figs. 4 and 6, a CONT (Continue) button is for designating continuation of processing. If the operator clicks the CONT button, exposure of a shot suffering a focus convergence error is skipped, and the flow advances to the exposure sequence of the next shot (shot B scan exposure command 416). An ABORT (Abort) button means the end of the exposure job (411), and is for aborting the job in progress and recovering all wafers in process. An RW (Reject Wafer) button is for aborting the exposure sequence of only the current exposure target wafer and recovering the wafer (412). If ~~N~~ No in sequence 406, the job immediately aborts (sequence stop 408), and the flow waits for a user button input shown in Fig. 6 (409). Choices in this case are a sequence 415, a RETRY (Retry) button for performing retry processing for a shot suffering a focus control error, and a FORCE (Force) button for performing forced exposure processing 410 when focusing fails. --

Please substitute the paragraph beginning at page 22, line 16, and ending on page 24, line 3, with the following.

-- Further, the present invention can be applied as error processing when the sync control precision in the alignment direction or the total exposure amount in the exposure slit that is calculated from a monitored illuminance exceeds a preset allowable amount. Whether sync control or exposure amount control achieves a desired precision can be determined only after

scan exposure starts. If emission of the exposure light source stops because the desired precision cannot be achieved, a partially unexposed portion is formed and adversely affects peripheral shots which have normally been exposed in developing the resist. Hence, the target shot is preferably completely exposed by forced exposure without stopping exposure when the sync control precision or exposure amount control precision deviates from a standard precision during exposure (to be referred to as a standard precision short error hereinafter). The next shot is normally processed with a high possibility for a standard precision short error generated by floor vibrations, a local factor of the wafer 120 (Fig. 1), or misfire of the pulse laser source 116 (Fig. 1) (omission of emission pulses). In many cases, a standard precision short error generated by the service life of the pulse laser source 116 or a fault of the exposure apparatus occurs at successive shots. Thus, the algorithm of the automatic continuation mode can be similarly applied to monitoring of the exposure amount control precision and sync control precision. The job can continue without stopping the apparatus for an inevitable standard precision short error caused by a local factor, resulting in high apparatus availability. A standard precision short error generated by an apparatus fault or the like can be determined to stop the sequence with a minimum damage by monitoring whether the error is generated at successive shots. As another method of stopping the sequence owing to repeated standard precision short errors, the errors are identified based on the total number of generated errors or the number of generated errors (generation rate) within a predetermined number of exposure shots, other than monitoring of errors at successive shots. --

Please substitute the paragraph beginning at page 25, line 26, and ending on page 26, line 8, with the following.

-- A production system for a semiconductor device (e.g., a semiconductor chip such as an IC or LSI, liquid crystal panel, CCD, thin-film magnetic head, micromachine, or the like) using the exposure apparatus will be exemplified. A trouble remedy or periodic maintenance of a manufacturing apparatus installed in a semiconductor manufacturing factory, or maintenance service such as software distribution is performed by using, e.g., a computer network outside the manufacturing factory. --

Please substitute the paragraph beginning at page 26, line 9, and ending on page 27, line 5, with the following.

-- Fig. 8 shows the overall system cut out at a given angle. In Fig. 8, reference numeral 801 denotes a business office of a vendor (apparatus supply manufacturer) which provides a semiconductor device manufacturing apparatus. Assumed examples of the manufacturing apparatus are semiconductor manufacturing apparatuses for performing various processes used in a semiconductor manufacturing factory, such as pre-process apparatuses (e.g., a lithography apparatus including an exposure apparatus, a resist processing apparatus, and an etching apparatus, an annealing apparatus, a film formation apparatus, a planarization apparatus, and the like) and post-process apparatuses (e.g., an assembly apparatus, an inspection apparatus, and the like). The business office 801 comprises a host management system 808 for providing a maintenance database for the manufacturing apparatus, a plurality of operation terminal computers 810, and a LAN (Local Area Network) 809 which connects the host management

system 808 and computers 810 to build an intranet. The host management system 808 has a gateway for connecting the LAN 809 to Internet 805 as an external network of the business office, and a security function for limiting external accesses. --

Please substitute the paragraph beginning at page 27, line 6, and ending on page 28, line 19, with the following.

-- Reference numerals 802 to 804 denote manufacturing factories of the semiconductor manufacturer as users of manufacturing apparatuses. The manufacturing factories 802 to 804 may belong to different manufacturers or the same manufacturer (pre-process factory, post-process factory, and the like). Each of the factories 802 to 804 is equipped with a plurality of manufacturing apparatuses 806, a LAN (Local Area Network) 811 which connects these apparatuses 806 to construct an intranet, and a host management 807 serving as a monitoring apparatus for monitoring the operation status of each manufacturing apparatus 806. The host management system 807 in each of the factories 802 to 804 has a gateway for connecting the LAN 811 in the factory to the Internet 805 as an external network of the factory. Each factory can access the host management system 808 of the vendor 801 from the LAN 811 via the Internet 805. The security function of the host management system 808 authorizes access of only a limited user. More specifically, the factory notifies the vendor via the Internet 805 of status information (e.g., the symptom of a manufacturing apparatus in trouble) representing the operation status of each manufacturing apparatus 806, and receives response information (e.g., information designating a remedy against the trouble, or remedy software or data) corresponding to the notification, or maintenance information such as the latest software or help information.

Data communication between the factories 802 to 804 and the vendor 801 and data communication via the LAN 811 in each factory adopt a communication protocol (TCP/IP) generally used in the Internet. Instead of using the Internet as an external network of the factory, a dedicated network (e.g., an ISDN) having high security which inhibits access of a third party can be adopted. Also, the user may construct a database in addition to the one provided by the vendor and set the database on an external network, and the host management system may authorize access to the database from a plurality of user factories. --

Please substitute the paragraph beginning at page 28, line 20, and ending on page 30, line 13, with the following.

-- Fig. 9 is a view showing the concept of the overall system of this embodiment that is cut out at a different angle from Fig. 8. In the above example, a plurality of user factories having manufacturing apparatus and the management system of the manufacturing apparatus vendor are connected via an external network, and production management of each factor or information of at least one manufacturing apparatus is communicated via the external network. In the example of Fig. 9, a factory having manufacturing apparatuses of a plurality of vendors and the management systems of the vendors for these manufacturing apparatuses are connected via the external network of the factory, and maintenance information of each manufacturing apparatus is communicated. In Fig. 9, reference numeral 901 denotes a manufacturing factory of a manufacturing apparatus user (e.g., a semiconductor device manufacturer) where manufacturing apparatuses for performing various processes, e.g., an exposure apparatus 902, a resist processing apparatus 903, and a film formation apparatus 904 are installed in the manufacturing line of the

factory. Fig. 9 shows only one manufacturing factory 901, but a plurality of factories are networked in practice. The respective apparatuses in the factory are connected to a LAN 960 to build an intranet, and a host management system 905 manages the operation of the manufacturing line. The business offices of vendors (apparatus supply manufacturers) such as an exposure apparatus 910, a resist processing apparatus manufacturer 902, and a film formation apparatus manufacturer 930 comprise host management systems 911, 921, and 931 for executing remote maintenance for the supplied apparatuses. Each host management system has a maintenance database and a gateway for an external network, as described above. The host management system 904 for managing the apparatuses in the manufacturing factory of the user, and the management systems 911, 921, and 931 of the vendors for the respective apparatuses are connected via the Internet or dedicated network serving as an external network 900. If a trouble occurs in any one of a series of manufacturing apparatuses along the manufacturing line in this system, the operation of the manufacturing line stops. This trouble can be quickly solved by remote maintenance from the vendor of the apparatus in trouble via the Internet 900. This can minimize the ~~stop~~ stoppage of the manufacturing line. --

Please substitute the paragraph beginning at page 31, line 19, and ending on page 32, line 19, with the following.

-- A semiconductor device manufacturing process using the above-described production system will be explained. Fig. 11 shows the flow of the whole manufacturing process of the semiconductor device. In step 1 (circuit design), a semiconductor device circuit is designed. In step 2 (mask formation), a mask having the designed circuit pattern is formed. In step 3 (wafer

manufacture), a wafer is manufactured by using a material such as silicon. In step 4 (wafer process) called a pre-process, an actual circuit is formed on the wafer by lithography using a prepared mask and the wafer. Step 5 (assembly) called post-process is the step of forming a semiconductor chip by using the wafer manufactured in step 4, and includes an assembly process (dicing and bonding) and a packaging process (chip encapsulation). In step 6 (inspection), inspections such as the operation confirmation test and durability test of the semiconductor device manufactured in step 5 are conducted. After these steps, the semiconductor device is completed and shipped (step 7). For example, the pre-process and post-process are formed in separate dedicated factories, and maintenance is done for each of the factories by the above-described remote maintenance system. Information for production management and apparatus maintenance is communicated between the pre-process factory and the post-process factory via the Internet or a dedicated network. --

Please substitute the paragraph beginning at page 32, line 20, and ending on page 33, line 15, with the following.

-- Fig. 12 shows the detailed flow of the wafer process. In step 11 (oxidation), the wafer surface is oxidized. In step 12 (CVD), an insulating film is formed on the wafer surface. In step 13 (electrode formation), an electrode is formed on the wafer by vapor deposition. In step 14 (ion implantation), ions are implanted in the wafer. In step 15 (resist processing), a photosensitive agent is applied to the wafer. In step 16 (exposure), the above-mentioned exposure apparatus exposes the wafer to the circuit pattern of a mask. In step 17 (developing), the exposed wafer is developed. In step 18 (etching), the resist is etched except for the developed

resist image. In step 19 (resist removal), an unnecessary resist after etching is removed. These steps are repeated to form multiple circuit patterns on the wafer. A manufacturing apparatus used in each step undergoes maintenance by the remote maintenance system, which prevents a trouble in advance. Even if a trouble occurs, the manufacturing apparatus can be quickly recovered. The productivity of the semiconductor device can be increased in comparison with the prior art. --

Please substitute the paragraph beginning at page 34, line 6, with the following.

-- Moreover, the above-described embodiment comprises a function of automatically determining retry or forced exposure. The stop time of the apparatus due to a wait for <u>an</u> operator determination can be minimized to increase the apparatus availability. --

Please substitute the paragraph beginning at page 34, line 11, with the following.

-- The present invention is not limited to the above embodiments and various changes and modifications can be made within the spirit and scope of the present invention. Therefore, to apprise the public of the scope of the present invention, the following claims are made. --